202301UECM2453OE2b

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Review of preview

Started on	Saturday, 4 March 2023, 05:49 PM
Completed on	Saturday, 4 March 2023, 05:49 PM
Time taken	8 secs
Grade	**0** out of a maximum of 10 (**0**%)

1

Marks: 1

Let c(S,T, K,r) and p(S,T, K,r) be the prices of call and put when the stock price is S, the time until expiration is T, the strike price is K, and the continuously compounded risk-free interest rate is r. You are given:

- The stock pays dividends continously at a rate proportional to its price. The dividend yield is 0.029.
- c(7,0.5, 8, 0.08) = 0.3421
- d c(7,0.5, 8, r)/dr $_{r= 0.08}$ = 1.0926

Approximate the value of p(7,0.5, 8, 0.071). _____

Answer:

Make comment or override grade

Incorrect
Correct answer: 1.154
Marks for this submission: 0/1.

2

Marks: 1

Assume the Black-Scholes framework. You are given that

- The current stock price is 34.
- The stock pays dividends continuously at a rate proportional to its price. The dividend yield is 0.026.
- The volatility of the stock is 0.26.
- The continuously compounded risk-free interest rate is 0.137.

Calculate the current volatility of a 6-month 35.0-strike European call option on the stock. _____

Answer:

Make comment or override grade

Incorrect
Correct answer: 1.74738
Marks for this submission: 0/1.

3

Marks: 1

You are given:

- For a stock whose time-t price is S(t), the risk-neutral process is

$$d[\ln S(t)] = 0.024dt + 0.22\, d\tilde{Z}(t),\ S(0) = 120.0$$

  where $\tilde{Z}(t)$ is a standard Brownian motion under the risk-neutral measure.
- The true stochastic process is

$$dS(t) = cS(t)dt + 0.22S(t)dZ(t),$$

  where Z(t) is a standard Brownian motion under the true probability measure and c is a constant.
- The stock pays dividends continuously at a rate proportional to its price. The dividend yield is 1.3%.

Consider an option that pays 1 one year from now if S(1) < 126.0. If the expected instantaneous return of the option at time-0 is -66.0%, find c. _____

Answer:

Make comment or override grade

Incorrect
Correct answer: 0.26592
Marks for this submission: 0/1.

4
Marks: 1

Let S(t) be time-t price of a nondividend-paying stock and C(S(t),t) be the time-t price of a 0.5-year at the money European call option written on the stock, when the time-t stock price is S(t). You are given that

- S(0.25) = 48.
- The true stock price process is

$$dS(t) = 0.22S(t)dt + 0.46S(t)dZ(t)$$

  where Z(t) is a standard Brownian motion under the true measure.
- The true stochastic process satisfied by the call option is

$$dC(S(t),t) = a(S(t),t)dt + b(S(t),t)dZ(t)$$

  for some a and b.
- The risk-neutral stochastic process satisfied by the call option is

$$dC(S(t),t) = 0.062C(s(t),t)dt + f(S(t),t)d\tilde{Z}(t)$$

  where f is a function and $\tilde{Z}(t)$ is a standard Brownian motion under the risk-neutral measuare.

Calculate a(48, 0.25). _____

Answer:

Make comment or override grade

Incorrect
Correct answer: 4.6272
Marks for this submission: 0/1.

5
Marks: 1

Let S(t) be the time-t price of a nondividend paying stock. You are given that S(t) follows the stochastic differential equation

$$dS(t) = 0.08S(t)dt + 0.3d\tilde{Z}(t),\ S(0) = 4,$$

where $\tilde{Z}(t)$ is a standard Brownian motion under the risk-neutral measure. A market maker has just written a contingent claim that pays the $S^2(3)$ after 3 years. He then immediately delta-hedge his position by trading stocks and cash. Calculate the cash position component in the hedge portfolio. _____

Answer:

Make comment or override grade

Incorrect
Correct answer: -26.64
Marks for this submission: 0/1.

6
Marks: 1

You are given that:

- For a stock whose time-t price is S(t), the risk-neutral process is

$$d[\ln S(t)] = 0.0989dt + 0.21d\tilde{Z}(t),\ S(0) = 23$$

  where $\tilde{Z}(t)$ is a standard Brownian motion under the risk-neutral measure.
- The stock pays dividends continuously at a rate proportional to its price. The dividend yield is 0.9%.
- A market-maker has sold 100 6-month 20-strike calls on the stock. He immediately hedges his position by buying shares and risk-free bonds. The dividends received are invested by purchasing extra shares.
- The current Black-Scholes price of the call is 4.2856.

After 1 month, when the stock price is 122 and the Black-Scholes price for the call becomes 102.5979, the maker-maker rebalances his hedge portfolio by trading shares and risk-free bonds. The maker-maker invests or repays dividends by purchasing or shorting extra shares. Compute the 1-month profit. _____

Answer:

Make comment or override grade

Incorrect
Correct answer: -752.364
Marks for this submission: 0/1.

7
Marks: 1

Assume the Black-Scholes framework. For a stock, you are given that:

- The current stock price 90.
- The stock pays dividends continuously at a rate proportional to its price. The dividend yield is 2.5%.
- The continuously compounded risk-free interest rate is 2.5%.

The current price of a 6-month 90-strike European call on this stock is 7.08. Calculate the implied volatility of this stock. _____

Answer: ✗

Make comment or override grade

Incorrect
Correct answer: 0.2828
Marks for this submission: 0/1.

8
Marks: 1

Assume the Black-Scholes framework. For a stock, you are given that:

- The current stock price 80.
- The stock pays dividends continuously at a rate proportional to its price. The dividend yield is 2.0%.
- The continuously compounded risk-free interest rate is 2.0%.

The current price of a 3-month 80-strike European call on this stock is 3.8085. Calculate the implied volatility of this stock. _____

Answer: ✗

Make comment or override grade

Incorrect
Correct answer: 0.24
Marks for this submission: 0/1.

9
Marks: 1

Let Z(t) be a standard Brownian motion under the risk-neutral measure. For a stock, you are given:

- The time-t stock price is S(t).
- The stock price process in the risk-neutral measure is

$$dS(t) = 0.028S(t)dt + aS(t)dZ(t),\ S(0) = 100,$$

  where a is a constant that is less than 0.2002.
- The stock pays dividends continuously at a rate proportional to its price. The dividend yield is 2.4%. The delta of a 2-year 100-strike put option on this stock is -0.3472.

Calculate a. _____

Answer: ✗

Make comment or override grade

Incorrect
Correct answer: 0.175
Marks for this submission: 0/1.

10
Marks: 1

You are given the following historical prices of a nondividend-paying stock:

Week	1	2	3	4	5	6
Stock Price	104	95	87	96	114	103

Let α be the stock's expected rate of return and σ be the stock's volatility. Estimate α + σ. _____

Answer: ✗

Make comment or override grade

Incorrect
Correct answer: 1.24737
Marks for this submission: 0/1.